Administrator's Column

(In this column, NASA Activities features an article by NASA Administrator James M. Beggs. These articles focus on subjects chosen by him that address topics of broad interest to the agency's employees. The column this month features an address presented to the American Stock Exchange Conference in Washington, D.C.)

Mankind's Future in Space

All Americans want to see their federal tax dollars go into programs that show results—programs that stretch our dollars; programs that give us interest and dividends; and programs that build our capital for the future.

I'm here to tell you about one program that does all that and more. The NASA program doesn't cost. It pays. It pays in many ways.

The NASA program is an investment in technology and in research. As such, it is an investment in America's future. And that's what progress and prosperity are all about.

All Americans can be proud that the NASA program puts the United States on the cutting edge of high technology and thus, helps to keep our economy strong and competitive. The program spurs innovation and productivity. It brings us new knowledge, creates new industries, new products, new jobs and a higher standard of living for all Americans. For more than 2 decades, it has kept us preemminent in space and in aeronautical technology.

Moreover, the products of space-age research—telecommunications technology, Earth sensing, weather forecasting, solid state electronics, medical electronics—the list could go on and on—are benefiting people everywhere.

Small wonder, then, that the NASA program inspires our young people to strive for excellence and give the best that is in them in whatever they do. If the program did nothing more than that, I believe it would be well worth the investment, because it is the young who will both shape and inherit the future.

I know I don't have to remind you that America's most important challenge today is to restore the quality hallmark to everything we produce. We need to get us back on the track of excellence and stay there. And if we can stoke the fires of excellence in the young, we will have gone a long way towards meeting that goal.

This year NASA is spending $7½ billion. That's eight-tenths of one per cent of the federal budget. We have spent about $100 billion over the agency's 26-year lifetime. That is also less than one per cent of total federal spending over that same period. So, we are a small agency as government agencies go. But, as the old English proverb says: "Great engines turn on small pivots."

Ninety cents out of every dollar we get is spent in the private sector, with industry and the universities. Indeed, business and universities, large and small, have been our partners from the beginning and have been essential to our successes.

Twenty-six years into the Space Age, we have done astounding things and learned much about the Earth, solar system and the Universe. Indeed, we have learned more about ourselves and our place in the Universe than in any other period in history.

Twelve Americans have walked on the Moon and 24 have returned from its vicinity. Our spacecraft have probed the planets and by the end of this decade, will have shown us the faces of all but one, distant Pluto. Thanks to the Space Shuttle, we now have routine access to and from space. And as I have already mentioned, the spin-offs and applications of space technology have changed our lives in ways we never could have imagined a quarter century ago.

Indeed, these changes have slipped into our lives so quietly that we take them for granted. Instant worldwide telephone service, programmable heart pacemakers, computer-controlled aides for the handicapped and the paralyzed—all these and more are products of space-age research.

In just 8 short years, we'll be operating permanently in space. Our base will be the Space Station we are beginning to develop now with our friends in Europe, Canada and Japan.

The Space Station and the new technologies and discoveries that will come with it will expand the peaceful uses of space and their applications to an extent we can hardly imagine today. This expansion will be far-reaching and will include a wide variety of scientific, commercial and industrial endeavors. Most important, it will assure United States leadership in space through most of the next century.

The Russian space pioneer Konstantine Tsiokowsky once said: "This Earth is the cradle of mankind; but

mankind cannot stay in the cradle forever." Indeed, we are now out of the cradle and entering an era in which entrepreneurs such as yourselves can take advantage of the many promising and potentially profitable opportunities on this new economic frontier.

What are the special advantages of space? Well, aside from freely available heat, light, and power, I would single out three other things.

First, there is the marvelous vantage point to observe the Earth and the Universe, high above the obscuring atmosphere of Earth.

With three satellites properly placed in geosynchronous orbit, you can communicate with anyone on the face of the globe. We can do that now, as we all know. I regret to say I know it only too well because every Sunday my wife picks up the phone and calls our daughter—in Singapore!

Second, you have weightlessness in space. We have found that is a very unique environment for manufacturing new products, such as alloys and pure crystals that cannot be made on Earth. For example, on our second Spacelab flight which ended early last month, we grew a small, ruby-red crystal of mercury iodide which had fewer imperfections than any of that type yet grown on Earth. Such improved crystals have many uses and ultimately could reduce radiation exposure for patients having CAT scans and X-rays.

The third unique advantage of space is the near-perfect vacuum. That vacuum is on the order of 10 to the minus 12 to 10 to the minus 14 torr. For you non-scientists, one torr is the pressure on Earth needed to support a column of mercury one millimeter high. If you divide a millimeter of mercury by 10 with 12 or 14 zeros in it, you get some idea of the vacuum space offers—a very good vacuum, indeed.

Many of our industrial processes need a vacuum, which is very expensive to get on Earth for a sustained period. But once you've paid to get into space you have it free.

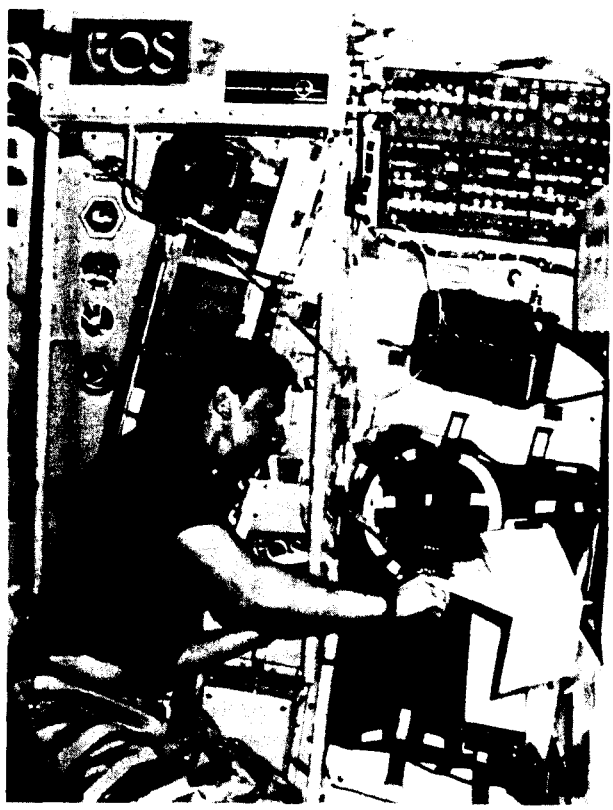
Many companies are already beginning to exploit these three properties of space through experiments they have sent up on the shuttle. And when the Space Station is up and operating, they will expand their activities because they will have permanent facilities in which to operate.

President Reagan said recently: "Before the end of the century, many billions of dollars of commercial activity will be taking place in and because of space."

Space is indeed open for business and there is enormous potential for the growth of commerce there. To help develop that potential, Congress allows NASA to write an agreement—we call it a Joint Endeavor Agreement—with any company who wants to go up and experiment. A company invests the money, time and resources to develop the experiment and we fly them free during the experimental stages. Later, if they were to go into commercial production, of course, they would pay their way.

Companies such as Johnson & Johnson and McDonnell Douglas, 3M and John Deere have signed such agreements with us. They are experimenting with processing materials ranging from pharmaceuticals to thin industrial films and organic crystals. Their experiences have convinced them that space processing is not only feasible, but could be very profitable as well.

Johnson & Johnson and McDonnell Douglas, for example, have put about $100 million over the past 8 years into a process called Electrophoresis Operations in Space. Electrophoresis is simply a process that separates materials by means of an electrical charge. It works on Earth, but not nearly as well as it works in space. The companies have been producing test quantities of a new pharmaceutical which has potential for treating successfully a disease we have relatively little control over now. They will be flying their experiments on many future flights and eventually, plugging into the Space Station. And I believe theirs

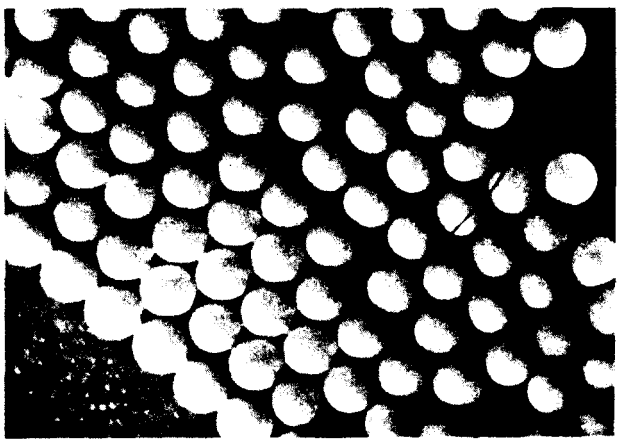


Charles D. Walker, 41-D payload specialist, closes a stowage area for biological samples supporting the electrophoresis system.

will be the first major industrial process to spring from our efforts to expand the commercial use of space.

There will be other processes and other products, some we may not have thought of yet, because serendipity will play a big part in all of these enterprises.

The first products made in space soon will go on the market. They are called monodisperse latex spheres. Each is incredibly tiny—about 10 micrometers in diameter—and all are of equal size. A vial of 15 million of them is as big as my index finger. But their market potential is great, indeed—estimated at between $200 million to $300 million a year.



Latex beads magnified 1000 times.

The spheres will be used to calibrate scientific instruments. They have a variety of other uses, including monitoring air pollution particles and finely ground products such as paint pigments, ink or explosives.

I am proud that the President is behind us, the Congress is behind us, and the public is behind us. And I hope that more companies will some day be part of this great adventure.

The media has devoted some attention recently to a company that is selling the idea of launching people's cremated remains into space. That could be the ultimate one-way trip. But I prefer to think about the 24 round trips we will be making each year by 1989 in the shuttle and the new products, new processes, new technologies and new discoveries that will flow from our permanent presence in space.

For as the poet Robert Herrick once wrote:

"If well thou hast begun, go on foreright;
"It is the end that crown us, not the fight."

We have begun well. And I hope and trust we will continue just as we have begun. For the ends are glorious indeed, not only for ourselves, but for future generations everywhere.

Joint Satellite Rescue Effort Planned

NASA and Hughes Aircraft Company are jointly developing plans for a Space Shuttle mission to attempt to salvage the Hughes Leasat 3 satellite in orbit. The technically complex salvage attempt will provide an opportunity to extend the shuttle's demonstrated capability to rendezvous with and salvage satellites in space.

The salvage attempt will take place under the terms of an agreement negotiated by NASA and Hughes Communications, Inc., a wholly-owned subsidiary of Hughes Aircraft Company.

Negotiations with the underwriters insuring Leasat 3 have been conducted by Hughes in New York and London. Agreement has been reached with Lloyd's and other European underwriters to proceed with the attempted salvage. Negotiations are continuing with the American underwriters.

Although the joint salvage effort will include elements never before attempted, it is based in large measure on experience gained by NASA during its repair of the Solar Maximum Mission satellite in April 1984 and its retrieval of the Palapa B-2 and Westar VI satellites in November 1984.

Pending an independent review of safety considerations by the Aerospace Safety Advisory Panel, the mission, as currently planned, will occur during shuttle flight 51-I, now targeted for launch no earlier than August 24. This date marks the opening of the window for rendezvous with the Leasat spacecraft. Mission duration will be 8 days to accommodate the shuttle rendezvous phasing required.

Following two flawless shuttle deployments and satellite activations of Leasat 1 and 2 in August and November of 1984, Leasat 3 failed to activate itself after successful deployment from shuttle orbiter Discovery on April 13, 1985, during mission 51-D. The satellite is currently drifting in low Earth orbit without command and telemetry capability. A rendezvous and salvage maneuver on April 17 went as planned, but the satellite failed to respond.

Immediately after the failure, Hughes initiated an intense investigation of all likely failure modes. Although the cause of failure can be isolated to the